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INFLUENCE OF DIFFERENT PRE-TREATMENT METHODS ON THE IMMOBILIZATION OF BREWER'S YEAST ON CORN COB PARTICLES

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Introduction. Immobilized cell systems have been successfully applied in the production of several biotechnological products, including the continuous production of beer. In previous years, cellulose-based carriers have been successfully applied and their importance as a carrier for continuous fermentations has increased as a consequence of their properties. Besides, previous studies have demonstrated the corn cobs capacity for yeast cells immobilization[1]. Being a suitable material for immobilization, corn cobs are also cheap and available in a large amount[2].
Thus, the main aim of this work was to evaluate the effect of different pre-treatment methods on yeast cells immobilization for different conformations of corn cobs particles. Derivatization was used as a procedure to achieve higher adhesion with a decrease on the immobilization time.

Methods. The corn cobs used on this work had three different conformations: cylinders (CC1); ¼ of cylinders (CC2); and milled corncobs (CC3). Two pre-treatment methods were evaluated, aiming at an increase in the carrier ability to immobilization: 1st Pre-treatment using hydrolysis with 1 % (v/v) HCL solution at 60 ºC followed by delignification with 1 % (v/v) NaOH solution[3] and 2nd pre-treatment in which the hydrolysis was performed by thermal treatment at 121ºC for 15 min followed again by delignification (1 % (v/v) NaOH). For each pre-treatment, the derivatization was performed according to Antrim and Harris[4]. For each experiment, cell suspension was added to the pre-treated carrier, and the decrease in the O.D. (600 nm) of free-cells was measured until stabilization.

Results and discussion. The used technique did not take in account cell growth,, only adhesion values (mechanical or by ion biding) were considered. From Table 1 the immobilization under different conditions can be analysed. It is also possible to see that the derivatization had, in terms of IEC, a major effect for CC3 carrier when using the second treatment. However, and still at this condition, this behaviour was not verified in the immobilization values being these similar regardless of the IEC values. On a few situations the increase of the IEC capacity was accomplished with a decrease of the immobilization time. On the other hand, the evaluation of this process requires that the amount of immobilized biomass is considered beside the immobilization time. Thus, among the pre-treatments without derivatization the 2nd pre-treatment method is the one that gives better results; while among the procedures using derivatization the 1st method appears to be the best.

Table 1. Biomass Immobilization, Ion Exchange capacity (IEC), and Immobilization time (T_{IMB}) for each assay.

Carrier	Assay	T_{IMB} / min	IEC / (meq/g)	Immobilization / ($mg_{BIOMASS}/g_{CARRIER}$)
CC1	1A	50	0.1281	1.851
	1B	40	0.1647	16.613
	2A	30	0.0558	5.851
	2B	30	0.0636	6.943
CC2	1A	50	0.1487	4.179
	1B	40	0.1765	9.758
	2A	30	0.0636	4.372
	2B	20	0.1301	5.204
CC3	1A	40	0.1317	1.892
	1B	40	0.2893	19.038
	2A	30	0.1749	3.788
	2B	30	1.1134	20.884

1A and 2A – First and second pre-treatment, respectively, without derivatization; 1B and 2B – First and second pre-treatment, respectively, with derivatization

Conclusions. The obtained results demonstrate that the derivatization procedure only had a real effect on biomass immobilization in CC3 particles. When using the first pre-treatment, derivatization influenced all the particles. It can be also be concluded that milled corncobs have a higher immobilization capacity in comparison with other particle conformations

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